

## **Woven Thermal Protection System (WTPS) a Novel Approach to Meet NASA's Most Demanding Reentry Missions**

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NASA's future robotic missions to Venus and outer planets, namely, Saturn, Uranus, Neptune, result in extremely high entry conditions that exceed the capabilities of current mid density ablators such as PICA or Avcoat. Therefore mission planners assume the use of a fully dense carbon phenolic heat shield similar to what was flown on Pioneer Venus and Galileo. Carbon phenolic is a robust TPS however its high density and thermal conductivity constrain mission planners to steep entries, high heat fluxes and pressures and short entry durations, in order for CP to be feasible from a mass perspective. The high entry conditions pose challenges for certification in existing ground based test facilities.

In 2012 the Game Changing Development Program (GCDP) in NASA's Space Technology Mission Directorate funded NASA ARC to investigate the feasibility of a Woven Thermal Protection System (WTPS) to meet the needs of NASA's most challenging entry missions. This presentation will summarize maturation of the WTPS project.